TRANSMISSION POTENTIALS ASSOCIATED WITH ZOONOTIC HELMINTHS OF CATTLE IN MINNA METROPOLIS, NIGERIA

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ABSTRACT. Zoonotic parasitic gastroenteritis has been well-known as a serious limitation to humans as well as livestock productivity in terms of man-power, pathology and fiscal losses, as human infection with these helminths from cattle can result from consumption of meat containing the infective stage of the worm. This study therefore investigates the presence of zoonotic helminth infections among cattle in Minna metropolis, and scientific basis for their potential transmission to human population. A total of 184 diarrhoeic faecal samples from cattle were collected from September 2014 to June 2015 in Minna, Niger state and processed using the direct faecal microscopic examination techniques. The obtained results showed that a total of 81 (44%) samples were positive including *Ascaris* sp, *Fasciola gigantica*, *Trichuris* sp. and *Taenia* sp. with infection rates of 22.3%, 12%, 2.2% and 0.5% respectively, and mixed infections of *Fasciola gigantic* with *Ascaris sp*. (4.3%) , and *Ascaris* sp. with *Trichuris* sp. (2.7%). Poor human hygiene, inadequate livestock husbandry managements and restriction of animals to residential areas are the major factors responsible for the high prevalence of zoonotic helminths and geo-helminths in the study area. Therefore veterinarians, animal handlers and livestock owners should practice personal hygienic and safe management practices for animal rearing and treatments.

Keywords: intestinal helminthes, geo-helminthes, zoonosis, diarrhoea, Minna.

INTRODUCTION

Cattle represent an important source of animal protein in most countries of the world, they supply a good percentage of the daily meat and dairy products in cities and villages in Nigeria. However, they can host a variety of gastrointestinal tract (GIT) parasites, many of which are shared by other ruminants (Nawathe *et al.,* 1985; Nwosu *et al.,* 2007).

Parasitic gastroenteritis has been identified as a serious hindrance to cattle production in terms of pathology and economic losses (Biu *et al.,* 2009) both at clinical and subclinical levels (Martínez-gonzález *et al.,* 1998). The losses due to gastrointestinal tract (GIT) parasitism can be direct as a result of acute illness and subsequent death or indirect from non-obvious clinical signs which can be detected at post mortem (Barger *et al.,* 1994). By tradition, in rural areas and semi urban areas, cattle are the mainstay of peoples' live as these animals are kept in close proximity with humans, hence there is a high probability of livestock owners being infected by parasites from livestock, via soil, food and or water contamination (Mage *et al.,* 1995).

Zoonotic infections are infections of animals that are naturally transmissible to humans, and as such often spread to humans through their companion and domestic animals (Goldsmid, 2005). Helminths are one of the most important and well-known zoonoses. They are classified into nematodes, cestodes and trematodes affecting both humans and animals (Robinson and Dalton, 2009).

Human infection with these zoonotic helminths from cattle may result from ingesting meat containing the cysticercus stage of the parasite (such as taeniasis and trichinosis), invertebrates hosts (fascioliasis) or ingestion of the infective stage of the worm with contaminated soil (Ascariosis), water or vegetables (fascioliasis and fasciolopsiasis), skin contact with contaminated soil or water containing active infective larvae stages from direct contact with animal feaces (trichuriasis) (Goldsmid, 2005). Veterinary interventions, faecal sample collection and animal husbandry practices involving animal-human interaction with cattle can also predispose to these zoonotic infections. Cultural farming practices involving the use of animal feaces as manure for crops destined to be consumed by humans can also serve as channel for transmission of these zoonotic helminths to human population, therefore there is a need for the evaluation of the prevalence of these zoonotic helminths for preventive and control measures.

Several of these zoonotic intestinal parasites like *Trichuris* sp., *Fasciola gigantica* and *Ascaris lumbricoides* have been detected from faecal samples of cattle in Nigeria; Markurdi (Omudu and Amuta, 2007), Maiduguri (Biu *et al.,* 2009) and Kano state (Yahaya and Tyav, 2014). In spite of the detection of these zoonotic helminths arising from cattle, there is however paucity of information on the zoonotic intestinal helminths of cattle in Minna, North-Central, Nigeria (Figure 1).

This study therefore aims at investigating the presence of some zoonotic intestinal helminths of cattle in Minna metropolis, and is designed to estimate the prevalence of zoonotic helminth infections among cattle in Minna metropolis, to provide scientific basis for their potential transmission and to identify the risk factors for transmission of infection within the human population, veterinary officers

Figure 1. Showing the map of Minna; the location of the study.

and animal handlers in the area, with a view of providing appropriate control and preventive measures.

METHODS

Sampling location

Minna, the state capital of Niger, a northcentral state in Nigeria, is situated at latitude: 9°36.8334′ N, longitude: 6°33.4164′ E and 299 meters elevation above sea level.

Sample collection

A total of 184 faecal samples were collected from cattle, from different locations in Changhaga and Bosso Local Government areas of Minna, Niger state, at the state Veterinary hospital. Colour (mucous to bloody) and consistency (pasty to watery) of the faeces were considered as standards for sample collection as described by Schoenian, (2007).

Faecal samples were carefully collected from the rectum of cattle using protective disposable gloves into clean and dry glass slides and afterwards transported to the Diagnostic parasitology laboratory section of the Niger State Veterinary Hospital, Bosso, Minna for parasite identification.

Detection of helminths

The faecal samples were placed on clean glass slides using saturated salt solution and subsequently covered with cover slips. Direct microscopic examination method as described by Urguhart *et al.,* [12] was used to process the faecal samples. The slides were examined microscopically for helminth eggs and oocysts using 10x and 40x objectives. Identification of the eggs was made on the basis of morphology and size of eggs.

Statistical analysis

The data thus obtained were analysed at different angles by calculating percentage positivity of gastrointestinal helminths.

RESULTS

Of the total 184 faecal samples analyzed, 81 (44%) samples were positive for four zoonotic gastrointestinal helminthes, including *Ascaris* sp., *Fasciola gigantica*. *Trichuris* sp. and *Taenia* sp. with infection rates of 22.3%, 12%, 2.2% and 0.5% respectively (Table 1).

Mixed infection rate of *Fasciola gigantica* and *Ascaris* sp. was 4.3%, while and *Ascaris* sp. and *Trichuris* sp. was 2.7% (Figure 2).

DISCUSSION

This study reveals that, cattle from the study area are infected with a variety of intestinal helminths of zoonotic importance including *Ascaris* sp., *Fasciola hepatica*, *Trichuris* sp. and *Taenia* sp. with 44% overall prevalence. The detection of some of the zoonotic helminths in the study area agrees with the outcomes of separate studies, in Eastern Nigeria (Fakae and Chiejina, 1993; Kingsley *et al.,* 2013) and in Northern Nigeria (Nwosu *et al.,* 2007; Biu *et al.,* 2009; Yahaya and Tyav, 2014; Okaiyeto *et al.,* 2007; Jatau *et al.,* 2011), the consistencies in previous studies and this present study suggests that mixed and semi intensive to

Table 1. Infection rate of different zoonotic intestinal helminths in cattle in Minna Metropolis

Ova of parasites	Number examined	Number of positive samples	Infection rate (%)
Ascaris spp	184	41	22.3
Fasciola gigantica	184	22	12
Trichuris spp	184	4	2.2
Taenia	184	1	0.5
Fasciola and *Ascaris*	184	8	4.3
Ascaris and *Trichuris*	184	5	2.7
TOTAL	184	81	44

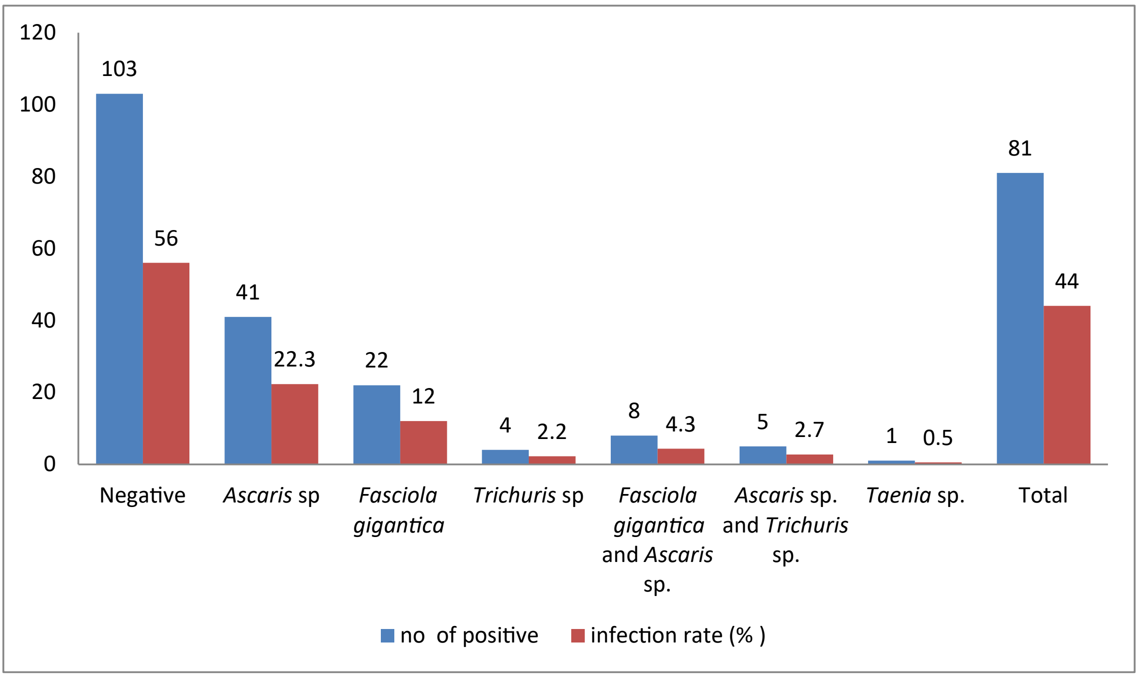

Figure 2. Showing percentage infectivity of the zoonotic helminths observed in the study

free range systems of animal husbandry practices by most livestock owners in these regions, coupled with the close housing of several animals species with little or no proper care and management, according to Nwigwe *et al.,* (2013) and Adejinmi *et al.,* (2015), can expose cattle to infection sources.

The infection rate of *Ascaris* sp. (22.3%) in this study is higher than 15.5% reported by Yahaya and Tyav, (2014) and the infection rate of *Trichuris* sp. (2.2%) is slightly lower compared to 2.6% reported by Biu *et al.,* (2009) which is indicative of the relative presence of these geohelminths in the study area, as this is due to soil contamination with the eggs of these helminths, while cattle graze the soil indiscriminately for food and water. The 2.7% prevalence of mixed *Ascaris* and *Trichuris* infections in this study corroborates Nejsum *et al.,* (2012) who observed that these geohelminths present evidence of zoonotic potentials. Analysis of the soil samples hitherto may reveal numerous infective eggs of *Ascaris* and *Trichuris* (Roepstorff *et al.,* 2011), as their human infections are associated with diarrhoea, malnutrition, impaired growth and development, and can lead to death (De Silva *et al.,* 1997; Bethony *et al.,* 2006; Hall *et al.,* 2008; Dold and Holland, 2011).

These geohelminths are transmitted principally through contaminated soil (Bethony *et al.,* 2006), therefore, newborns and children living in these areas can be at risk of getting infected with soil-transmitted helminthiasis (SHT), whereas the parasitic infection occurs through fecal contamination with SHT. Moreso, veterinarians and animal handlers can also be at risk especially during collection of feacal samples and rectal palpation procedures on cattle, because these geohelminths present enormous burden and persistent infection to humanity (Holland and Kennedy, 2002; Bethony *et al.,* 2006).

Holland and Boes, (2002) reported that *Ascaris* and *Trichuris* are important helminth infections in humans and pigs worldwide, however their detection in cattle in the study might be due to the practice of using pig manure as fertilizers. While grazing cattle browse green leaves, they ingest the eggs of these helminthes in the vegetations. Although, *Ascaris* infection is generally thought to be uncommon in humans, it is endemic in developing countries (Maguire, 2005) and is due to foodborne infection caused by these helminths (Raisanen *et al.,* 1985).

The 12% infection rate of *Fasciola gigantica* in this study area is higher than 5.6% in Kano (Yahaya and Tyav, 2014), 8.56% in Ibadan (Adedipe *et al.,* 2014) and 3.7% in Edo state (Edosomwan and Shoyemi, 2012), but lower than 51.1% in Ghana (Squire *et al.,* 2013). This probably indicates an increasing prevalence of Fascioliasis in cattle in Nigeria due to its relative zoonotic potential from Ghana which shares geographical boundary with Nigeria with successive increases in international trade.

The observed prevalence of *Fasciola gigantica* in cattle in this study corroborates with Mas-Coma *et al.,* (2014) who noted that it is a parasite of ruminant origin. Although over the past twenty years, human fascioliasis has gained significance as an important disease in humans and can cause significant illness and morbidity, mainly among low income, farming communities, due to the corresponding presence of snail species responsible for its transmission.

Factors identifiable in the study as contributory to the observed increase in infection rate and potential human transmission of fascioliasis include, high density of both human and animal populations living in close proximity, the presence of abattoir and low levels of meat inspection and biosafety measures, the use of untreated water sources for household use and/or use of untreated wastewater and sewage for agriculture (Mas-Coma *et al.,* 2005; Carrique-Mas and Bryant 2013), and little or no knowledge of public health awareness.

Therefore, the possibility of transmission of animal fascioliasis to humans is high where close proximity of humans with domestic animals is common (Mera *et al.,* 2011). Nyindo and Lukambagire, (2015) reported that there is a high prevalence of fascioliasis among herding communities in low income countries because of their constant close association with livestock that they keep, and it is rather unfortunate that in Nigeria burdened by poverty and infectious diseases, human fascioliasis is not a recognised and reportable disease. Public health awareness and sensitisation therefore are the first steps to any planned intervention strategies.

Therefore, this study agrees with Pawlowski, (1996) that the restriction of animals within residential households diminishes hygienic standards and can undo the biological barriers between livestock and man. Furthermore, emergence and re-emergence of zoonotic infections can occur, hence precautionary measures must be taken by clinicians and animal handlers.

CONCLUSION

Poor human hygiene and livestock husbandry managements are the major factor responsible for the high prevalence of zoonotic helminths and geo-helminths, therefore livestock owners should be educated on human hygienic and safe managemental practices for animal managements. Veterinarians and animal handlers should ensure safe diagnostic practices and should adequately protect themselves by wearing protective gloves when carrying out diagnostic and sample collection procedures on animals as this can serve as route of infection. Residents in this study area should be well educated on the danger of rearing mixed species of animals without proper husbandry, and in restricting animals to residential areas as this can lead to potential outbreak of zoonotic diseases in both the young, old and immunocompromised humans.

REFERENCES

1. Adedipe O.D., Uwalaka E.C., Akinseye V.O., Adediran O.A and Cadmus S.I.B. (2014). Gastrointestinal helminths in slaughtered cattle in Ibadan, South-western Nigeria. Hindawi Publishing Corporation. *Journal of Veterinary Medicine*; Article ID 923561, 6 pages, 2014. https://doi.org/10.1155/2014/923561
2. Adejinmi O.O., Adejinmi J.O., Falohun O.O., Aderoju O.R. and Dauda W.J. (2015). Prevalence of gastrointestinal parasites of goats in Ibadan, Southwest, Nigeria. *World Journal of Agricultural Research*, **3(2):** 49-51.
3. Barger I.A., Siale K., Banks D.J.D. and Jambre L.E. (*1994*). Rotational grazing for control of gastrointestinal nematodes of goats in a wet tropical environment. *Veterinary Parasitology,* **53:**109-116.

4. Bethony J., Brooker S., Albonico M., Geiger S.M., Loukas A., Diemert D. and Hotez P.J. (2006). Soil-transmitted helminth infections: ascariasis, trichuriasis, and hookworm. *The Lancet*, **367(9521):** 1521-1532.
5. Biu A.A., Maimunatu A. and Salamatu A.F. (2009). A faecal survey of gastro-intestinal parasites of ruminants on the University of Maiduguri research farm. *Intern. J. of Biomed and Health Sci*, **5(3):** 115-119.
6. Carrique-Mas J.J. and Bryant J.E. (2013). A review of foodborne bacterial and parasitic zoonoses in Vietnam. *EcoHealth*, **10(4):** 465-489.
7. De Silva N.R., Chan M.S. and Bundy D.A.P. (1997). Morbidity and mortality due to ascariasis: re-estimation and sensitivity analysis of global numbers at risk. *Tropical Medicine & International Health*; **2:** 519-528.
8. Dold C. and Holland C.V. (2011). Ascaris and ascariasis. *Microbes Infections*, **13:** 632-637.
9. Edosomwan E.U and Shoyemi O.O. (2012). Prevalence of gastrointestinal helminth parasites of cattle and goats slaughtered at abattoirs in Benin City, Nigeria. *African Scientist*, **13(2):** 109-114
10. Fakae B.B and Chiejina S.N. (*1*993). The prevalence of concurrent trypanosome and nematode infections in West African dwarf sheep and goats in Nsukka area of Eastern Nigeria. *Vet. Parasitology*, **49:** 313-318.
11. Goldsmid J. (2005). *Zoonotic infections – an overview* Chapter 14. Available at http://www.tropmed.org/primer/chapter14.pdf
12. Hall A., Hewitt G., Tuffrey V. and de Silva N. (2008). A review and meta-analysis of the impact of intestinal worms on child growth and nutrition. *Maternal and Child Nutrition*, **1:** 118-236.
13. Holland C. and Boes J. (2002). Distributions and predisposition: people and pigs. In: *The geohelminths: Ascaris, Trichuris and hookworm*. Kluwer Academic Publishers; pp 1-24.
14. Holland C. and Kennedy M.W. (2002). *The geohelminths ascaris, trichuris and hookworm,* Kluwer Academic Publishers, 335 pp.
15. Jatau I.D., Abdulganiyu A., Lawal A.I., Okubanjo A.I and Yusu K.H. (2011). Gastrointestinal and haemoparasitism of sheep and goats at slaughter in Kano, northern-Nigeria. *Sokoto Journal of Veterinary Sciences*, **9 (1):** 7-11
16. Kingsley E., Ovutor O. and Barine L.G. (2013). Prevalence of species of helminthes parasites in cattle slaughtered in selected abattoirs in Port Harcourt, South-South, Nigeria. *International Research on Medical Sciences*, **1(2):** 10-17.
17. Mage C., Genery J. and Reynal P.H. (1995). Parasitology and animal husbandry: present situation and projected evaluation. *Veterinary Bulletin*, **13:** 265-270
18. Maguire J. (2005). Intestinal roundworms. *Principles and practices of infectious diseases*. 6th edn; pp. 3260-3267
19. Martínez-gonzález B., Díez-baños N., Rojo-vázquez F.A. (1998). An epidemiological study of gastrointestinal parasitism in dairy sheep flocks in León (NW Spain). *Small Ruminant Research*, **(27):** 25-30.
20. Mas-Coma S., Bargues M. D. and Valero M.A. (2005). Fascioliasis and other plant-borne trematode zoonoses. *International Journal for Parasitology*, **35(11-12):** 1255-1278.
21. Mas-Coma S., Valero M.A., and Bargues M.D. (2014). Fascioliasis in digenetic trematodes, *Advances in Experimental Medicine and Biology*, **766:** 77-114
22. Mera y Sierra R., Agramunt V.H., Cuervo P and Mas-Coma S. (2011). Human fascioliasis in Argentina: retrospective overview, critical analysis and baseline for future Research. *Parasites & Vectors*, **4(1):104** doi:10.1186/1756-3305-4-104. 18 pp.
23. Nawathe D.R., Sohael A.S and Umo I. (1985). Health management of a dairy herd on the Jos Plateau (Nigeria). *Bull. Anim. Health. Prod. Africa,* **(33):** 199-205
24. Nejsum P., Betson M., Bendal R.P., Thamsborg S.M and Stothard J.R. (2012). Assessing the zoonotic potential of *Ascaris suum* and *Trichuris suis*: looking to the future from an analysis of the past. *Journal of Helminthology*, **86:** 148-155
25. Nwigwe J.O., Njoku O.O., Odikamnoro O. O. and Uhuo A.C. (2013). Comparative study of intestinal helminths and protozoa of cattle and goats in Abakaliki metropolis of Ebonyi State, Nigeria. *Advances in Applied Science Research*, **4 (2):** 223-227.
26. Nwosu C.O., Madu P.P. and Richards W.S. (2007). Prevalence and seasonal changes in the population of gastrointestinal nematodes of small ruminants in the semi-arid zone of North-Eastern Nigeria. *Vet. Parasitol*. **15(144):** 118-124.
27. Nyindo M and Lukambagire A. (2015). Fascioliasis: an ongoing zoonotic trematode infection. *BioMed Research International,* 2015, Article ID 786195, 8 pp, https://doi.org/10.1155/2015/786195.
28. Okaiyeto S.O., Tekdek L.B., Sackey A.K.B, and Ajanusi O.J. (2008). Prevalence of haemo and gastrointestinal parasites in sheep and goats kept by the normadic fulanis in some Northern states of Nigeria. *Research Journal of Animal Science*, **2(2):** 31-33.
29. Omudu E.A. and Amuta E.U. (2007). Parasitology and urban livestock farming in Nigeria: prevalence of ova in faecal and soil samples and animal ectoparasites in Makurdi. *Journal of the South African Veterinary Association,* **78(1):** 40-45.
30. Pawlowski Z.S. (1996). Helminthic zoonoses affecting humans in Africa. In: *Veterinary medicine: impacts on human health and nutrition in Africa.* SLU/Repro, Uppsala, Sweden, pp 41-50
31. Raisanen S., Ruuskanen L. and Nyman S. (1985). Epidemic ascariasis – evidence of transmission by imported vegetables. *Scandinavian Journal of Primary Health Care*, **3:** 189-191.

32. Robinson M.W and Dalton J.P. (2009). Zoonotic helminth infections with particular emphasis on fasciolosis and other trematodiases. *Phil Trans R Soc*, **364 (1530):** 2763-2776.
33. Roepstorff A., Mejer H., Nejsum P. and Thamsborg S.M. (2011). Helminth parasites in pigs: new challenges in pig production and current research highlights. *Veterinary Parasitology*, **180:** 72-81.
34. Schoenian S. (2007). Diarrhoea (scours) in small ruminants. In: *Maryland Small Ruminant Page.* Accessed: https://www.sheepandgoat.com/scours
35. Squire S.A., Amafu-Dey H and Beyuo J. (2013). Epidemiology of gastrointestinal parasites of cattle from selected locations in Southern Ghana. *Livestock Research for Rural Development,* Volume 25, Article #117.
36. Urguhart G.M., Armour J.J., Duncan J.L., Dunn A.M and Jennings F.W. (1987). *Veterinary parasitology,* ELBs, Bath Press, Avon, Great Britain. pp 275-281.
37. Yahaya A. and Tyav Y.B. (2014). A Survey of Gastrointestinal parasitic helminths of bovine slaughtered in abattoir, Wudil Local Government Area, Kano State, Nigeria. *Greener Journal of Biological Sciences*, **4(4):** 128-134.

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